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ABSTRACT

This paper ties technologies used in education to purposes of education by correlating technologies with structures and structures with purposes. The paper begins with an exploration of the history of higher education structures, showing how technological innovation is a key component of major improvements in access to education. Next, the debate between advocates and critics of online education is considered against the backdrop of the three purposes of education: creating of an educated citizenry; resolving social inequities; and making educational systems more efficient. Finally, a vision of using online technology as a unifying influence is presented, bringing the three purposes of education into accord to support individual learners. Highlights include individualization of instruction and guidance, interactions among students and teachers, improvements in pedagogy, issues of equity, and a new model, called "Education for One," that includes five components: expanding access to education; the realization that one-size-fits-all curricula limit the effectiveness of education; the individualized nature of instruction; time and place independence of students and teachers; and cultivation of an academic community that is parallel to and integrated with the parent institution. Contains 17 references. (MES)

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Conflicting Purposes of Education: Will Improving Access to Higher Education Undermine Quality?

By Cathleen A. Kennedy

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Conflicting Purposes of Education:
Will Improving Access to Higher Education Undermine Quality?

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Preface

As the Information Age erodes the role of traditional institutions, particularly those that have been empowered by controlling access to information, we see emergence of an opportunity for truly democratizing society. American institutions of higher education are an excellent example of systems that have the potential to change dramatically as a result of technological innovation. The question is: Can the system maintain educational quality in light of the changes? At the heart of this question are three potentially conflicting purposes of education: to create an educated citizenry, to resolve social inequities, and to make educational systems more efficient.

What does it mean to create an educated citizenry? Of course, there are many definitions of what education is, running along a continuum from a strictly classical curriculum to a highly practical job-oriented collection of courses. We might argue that education also includes cultural aspects that socialize students to academe as well as to the larger culture of which education is a part. For the purpose of this paper, I define education as embracing the educational philosophy of the Enlightenment, reviving curricula and practices that develop the intellect, encourage moral character, instill an appreciation for learning, and equip students with the skills they need to continue learning outside of academic institutions (Downs, 1998; McClintock, 1998; Shapiro, 1996). In addition, I do recognize that students must be prepared for current and future economies, particularly with respect to the effects of globalization on competition for jobs, redistribution of wealth, and replacement of governmental/political influence with corporate/economic influence. Education must also cultivate an appreciation for current events in the context of history.

What does it mean to resolve social inequities? Today, we tend to think of this as opening the doors of higher education to traditionally under-served populations such as the poor, those who have not had successful prior educational experiences, and adults who have been away from school for some years. In order to improve social mobility and equalize access to the professions we need to rethink academic curricula and the roles of various academic institutions. We need to differentiate between different purposes within this area by clarifying whether we mean equal outcomes for all students, equal experiences within the educational process, or equal opportunity to achieve to one's potential. Providing for equal outcomes implies that we would design educational systems so that any individual could attain any professional goal, regardless of natural ability or disposition. One result of this might be degradation of the meaning of post-secondary degrees. Giving all students an equal educational experience suggests that every student would follow the same course of study, with some students surviving and others failing. Everyone gets a chance to try, but what do the non-survivors do with the rest of their lives? It seems pretty clear that the first two possible definitions would lead to terribly frustrated teachers and students, and probably wouldn't go far in advancing the cause of social equity. In fact, they would be more likely to cause further differentiation and inequities. In this paper, then, I define equity as providing educational opportunities for students to recognize and then achieve their potential.

What do we mean by economic efficiency? Federal and state spending patterns for higher education make it clear that we can expect continued reductions in government appropriations for higher education. This suggests that we will have to find ways to reduce the cost of providing education while trying to improve access and academic quality. Institutions will be challenged to provide space for the large numbers of new students we expect to enroll in the coming decade, and professors

will be challenged to adopt practices that are effective in the wake of increasingly heterogeneous student populations.

Unfortunately, the goal of creating an educated citizenry can lead to greater social inequity if it causes further differentiation of students, such as academic, professional and vocational stratification. On the other hand, expanding access to higher education can contribute to social equity when that education leads to employment and social mobility, and promotes tolerance and civility. Expanding access will also lead to a larger and more diverse student population across institutions of higher education, thereby straining the budgets of publicly funded institutions. One response to such economic pressure will be to make these larger systems more efficient by categorizing students according to academic "potential," thereby promoting differentiation and ultimately negating any improvements in equity. Despite these initial conflicts, the first two purposes of education might be achieved by improving access to education when the curriculum is designed appropriately. In addition, if we find that technology can be used to increase accessibility to higher education more economically than alternate methods, then we may be able to reconcile all three purposes of education. It is my view that technology can help us achieve this goal. In particular, highly interactive, Internet-based technologies can fortify the structure of our educational system by making information more accessible and individualizing the ways knowledge is acquired.

Introduction to the Paper

Historically, purposes of education have been shaped by values of the period, and the structure of educational systems and tools used by students have been dictated by available technologies. I want to clearly state at the outset that I'm not suggesting that technology drives changes in educational structures; what I am suggesting is that advances in technology make possible the changes we have seen historically in the ways students gain access to information and participate in educational processes. Certainly, not all technological innovations showing potential for improving access have been enthusiastically adopted by educators or by academic institutions. Telegraph, telephone, radio and television had limited impact, if any (Tyack and Cuban, 1995). Among these, television showed the most promise. Although televised education did increase access, there were no accompanying reforms to the structure of education or improvements in instructional quality, and thus no compelling reason to sustain the format over time. In fact, television introduced some of the negative effects that educators worry about today as the merit of online education is debated (Tyack and Cuban, 1996). For technological innovation to truly effect change in educational systems, it must coincide with a perceived need for change that the technology can support.

Throughout this paper, I try to tie technologies used in education to purposes of education by correlating technologies with structures, and structures with purposes. I begin with an exploration of the history of higher education structures, showing how technological innovation is a key component of major improvements in access to education. Next, I consider in some detail the debate between advocates and critics of online education against the backdrop of the three purposes of education: creation of an educated citizenry, resolution of social inequities, and making educational systems more efficient. Finally, I conclude with a vision of using online technology as a unifying influence, bringing the three purposes of education into accord to support individual learners.

An Historical Perspective of Higher Education Structures

The Socratic view of the value of education is that the properly trained mind will guide individuals toward the virtuous path and thoughtful leadership. It has never been completely supplanted by newer purposes, although it has been obscured from time to time by competing social and economic interests (Goodlad, 1984). Educational purpose is not a simple application of philosophical theory, but a reaction to social mores and public demand. In this section I explore the ways technology has helped shape new educational structures and supported educational purposes.

Before textbooks became available, students had little choice but to attain knowledge by listening to scholars or by becoming students of monasteries or academies where original scholarly works were stored. The handwritten textbook is arguably the most significant technology to transform education over the past 3,000 years, for it is the textbook that allowed knowledge to be recorded and transported for the first time. No longer did scholarship rely on memory only. Historians believe the earliest textbooks were transcriptions of Plato's lectures in the 4th century BCE.

Early centers of learning were monastic schools, established in large numbers in the 3rd through 7th centuries as retreats for scholars. Students joined abbeys to learn from the scholars of the day and to have access to the archives of ancient works, or more often, to copies of the ancient works. They spent their time reading and transcribing theological works, using the tools of the day—writing with reed pens onto papyrus scrolls—to expand access to the existing body of knowledge. Creativity and new contributions to the knowledge base were limited to adorning handwritten masterpieces with artistic flair. We might conjecture that the purpose of education in this environment was to develop personal discipline, to interpret and contemplate the theological meaning of existing knowledge, and to transcribe that knowledge for sharing with others.

In the early Medieval period, universities were established as students migrated to the cities of masters to learn from them directly. Students of that period attended lectures by scholars of note and worked with advanced students in a student-tutor environment. In the "Statutes for the University of Paris of 1215" we find that:

> No one is to lecture at Paris in arts before he is twenty years old. He is to listen in arts at least six years, before he begins to lecture.....We decide concerning the theologians, that no one shall lecture at Paris before he is thirty-five years old, and not unless he has studied at least eight years (Courcan, 1215).

Students learned by listening and discussing their interpretations, occasionally contributing to the growing pool of written knowledge that was preserved in university and monastery libraries and archives. Small numbers of students and faculty members organized into groups, similar to the guilds of that period, with focused interests in law, theology and medicine. Most universities were dedicated to one of these three higher faculties, which had their root in specific content, respectively the civil code, the Bible, and the decrees of the medical profession. During the Medieval period, an earlier purpose of education returns: to encourage critical thought and the exercise of reason (Readings, 1992). The emerging subjects and pedagogies of this period were rooted in the educational purpose of the early Greeks to develop intellectual abilities and moral character (Courcan, 1215). The technology of the day continued to be archives and libraries of handwritten works, though the tools did change. A thinner parchment paper was used instead of papyrus, and quill pens allowed smaller writing than reed pens, thereby making it possible to store much more information in a significantly smaller space and allowing scribes to write more quickly. These advances made it possible to record and store much more information and made increased access possible. Still, little change was evidenced in educational structure throughout the preceding millenium.

It wasn't until the late the 15th century, with development of the printing press, that universities became large institutions with thousands of students. During this period, humanist tenets began to replace the theological approach to teaching and learning, and academic institutions began to focus on nurturing the individual's natural tendency toward rational thought and goodness; there was renewed interest in developing "good citizens" by expanding access to the universities (Woodward, 1996). By mid-Renaissance, dozens of universities were established throughout England and Europe. Printing technology had a great impact on accessibility to information and to higher education throughout the Renaissance period.At the same time, hints of a change in attitude about the purpose of education arose, as philosophers and statesmen began to think of education as a means to achieve

social equity.

In the 18th century, we see the influence of Comenius and Rousseau in bringing education to more people. Comenius advocated teaching in the vernacular and Rousseau advanced a political philosophy that rational people will choose for the common good, suggesting that educating more people will improve society (Rousseau, 1755). Although technology improved availability and access to education, the structure of higher education remained very similar to the monastic schools of the 3rd century: Students continued coming to centers of learning for access to the knowledge base of the day: scholars and libraries.

In the United States, higher education quickly took on aspects of social and economic reform. From the very beginning, there was an American attitude of innovation propelling us toward educational policies that would accommodate the new republican form of government that depended upon an independent citizenry capable of democratic rule (Cremin, 1970). Early in the Industrial Age, American students attended universities primarily to become doctors, lawyers, theologians and statesmen. As the economy moved out of a dependence on industry and into a dependence on service, new professional occupations emerged and educational institutions responded to public pressure to train people for the new professions. In the 19th century, government began supporting more widespread access to higher education. Land-grant colleges were developed specifically to meet the changing needs of American society, "to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life" (Morrill, 1862). At about the same time, the invention of the cylinder press in France revolutionized the printing trade making textbook publication easier and cheaper. In addition, development of the metal pen, replacing the quill pens that had been used for the previous 1,300 years, and improvements in the manufacture of paper, dramatically improved the writing tools available to students. Inexpensive books, paper and pens became the new tools of the student.

As education became part of the service industry, the business objectives of efficiency and systematization were applied to academic institutions across America which were experiencing explosive growth (Cremin, 1970). Driven by the need to train more people for work and facilitated by readily available textbooks and standardized assessment tests, correspondence courses were developed, allowing students to study at home and correspond with educational institutions and faculty via the mail. "Distance education" students were deemed trained when they either completed the prescribed coursework or passed the corresponding examination. Quite often, students would work at their own pace. For the most part, however, correspondence courses did not qualify for academic credit in institutions of higher learning. They were seen, rather, as an extension to the university curriculum and satisfied the purpose of expanding access to vocational and professional training.

The mid-20th century brought a new method of delivering university-credit courses to the public: television. Students no longer needed to be physically present at a college or university to "attend" a lecture. Telecourses were seen by proponents as a cost-saving measure designed to accommodate large numbers of students: teachers were not paid for lecture time, enrollment was not limited by seats in a classroom, and tests were scored by machine (Tyack and Cuban, 1995). Some institutions, notably community colleges, saw dramatic declines in enrollment in on-campus courses as students stayed home to watch prerecorded educational programs on television while receiving university-level credit. Students participating in telecourses typically communicated with their instructors via postal mail and telephone, rarely seeing their instructors except for exams. Although telecourse students generally performed as well as students who attended classes on campus, surveys of telecourse students at College of San Mateo reveal that they only attended telecourses because they could not attend on-campus classes. Why would most telecourse students prefer to take traditional classes with a professor on campus? Survey results suggest that students value the expertise and personal attention they get from professors in face-to-face classes and interactions with other students.

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Telecourses remove elements of interaction and acculturation without adding anything significant, following the same basic educational structure and pedagogy common to traditional courses: televised programs are at broadcast specified times, content is teacher-driven, students are evaluated primarily by examination, and courses must be completed within a prescribed number of weeks. Initial attempts at online education simply copied this format into a new, Internet-based medium, sometimes enhanced with additional communications tools such as online conferencing and electronic chatting, to support asynchronous and synchronous group communications. This use of technology, to simply replicate the most trivial aspects of traditional educational structures and pedagogy, is missing the mark; a televised "talking head" or online versions of a textbook are no improvement over didactic lectures and 10-pound tomes. We don't need more technology; we need more thoughtful application of technology to meet current educational challenges (Cuban, 1996).

Promises of the Advocates

Advocates of online education claim that it delivers benefits to students, teachers, and institutions. Some of the benefits are identical to the promises of technology-advocates of the past: improved access to education, better productivity for teachers and administrators, and reduced costs. In this section, I explore the advocates' position on how online technology delivers on these promises in new ways.

For students, Internet technology puts vast amounts of information within easy reach. Instructors and students can communicate with a variety of online tools and learning can be individualized, incorporating formats suited to students with various learning styles. Teachers benefit from the experience of rethinking courses as they develop content and format for online delivery. Some find that they spend more time working with students as mentor or guide than as a transmitter of knowledge. Collegiality is also enhanced as teachers support one another in developing course materials and learning to manage communications with students. It doesn't take much imagination to see how these benefits to students and teachers can also enhance on-campus learning. For institutions, online courses provide a way of accommodating more students when classrooms are already full. In an open enrollment environment like California community colleges, we find campuses that are refusing students simply because classrooms are filled day and night. Providing online courses can be much more economical than building new campuses or buildings. (Of course, we would still face the challenge of finding enough teachers.) In addition, providing online courses may represent a preservation of revenue that would be lost if on-campus students were to leave to take online courses offered by other institutions.

Online education encompasses all aspects of using computers connected to the Internet for educational purposes: registration, student support services, communication with instructors and other students, research, presentations, and coursework. The interactive nature of Internet technology differentiates online education from prior distance learning methods. In addition, unlike telecourses that are often imposed on colleges by administrative units, institutions are developing online courses and student support services from the bottom up, as grass roots efforts stemming from faculty interest in meeting the needs of students (Cuban, 1996).

The student-focused nature of online education supports the idea of developing competent students who are motivated and engaged in the process of learning. We sometimes refer to this as the student "pull" model, as contrasted with teachers "pushing" information at students who may or may not make use of it at that moment. With online learning, students decide when they want to access information and sometimes they can decide in what format—text, video, graphic or sound. On the downside, students who work online don't have the built-in support mechanisms that are present when they see their teachers in class several times a week and communicate directly with other students in the class. These

mechanisms may be essential components of successful learning for some students. Proponents of online learning suggest that those mechanisms CAN be built into online courses. For example, teachers can send regular emails to inquire about student progress or send reminders; they can make themselves available at specific times to answer phone calls in person or initiate online chat sessions in real time; and students can be encouraged to work with a partner or small group of classmates for support, using email, online conferencing or online chatting to frequently check-in with one another.

Students in online courses may learn much more than the defined course objectives that on-campus students learn in the same course. Information literacy can be greatly enhanced with online learning when students use new communication and research tools, discover vast reservoirs of information, and refine their ability to critically evaluate information.

In summarizing the position of the advocates of online education, we find one way to reconcile the three educational purposes: 1) ***Creating an educated citizenry***. By reaching more people, and incorporating guidance practices that embrace traditional educational values, students can be encouraged to develop a plan of study that integrates intellectual and personal growth with academic and career goals. Teachers of online courses can focus on modeling and guiding scholarly inquiry and engaging students in the process of their own learning. In addition, teachers courses can fulfill a mentoring role to help individual students understand the relationship of a specific course to other courses in the discipline, to other disciplines, to academic degrees, and to work. Students can then use education, not only job training, as a basis for determining suitable occupations throughout their lifetimes. 2) ***Resolving social inequities***. Online technologies make education accessible to more people, particularly those who cannot attend or reside on a campus. Students can access courses, instructors, tutors, tutorials, counselors, and many kinds of college information by using computers connected to the Internet from home, from work, from public libraries, or from on- and off-campus college-sponsored computer centers. 3) ***Making educational systems more efficient***. Once an online course has been developed, subsequent costs for delivering the course include the teacher's pay, and some fraction of the cost of maintaining the computing system and technical support for the teacher. Since the teacher's pay should remain constant whether teaching a class on campus or online, the variable cost of offering a course is the facilities maintenance part. It is hard to imagine that this will be greater for an online course than for a course on campus which requires the cost of building utilities, maintenance, custodial services, and sometimes new capital outlay for additional buildings and classrooms. The development cost of an online course is highly dependent on the institution: At College of San Mateo, teachers usually are relieved of one courseload in the semester that they do course development.

Warnings of the Critics

One can illustrate the conflicting purposes of education arising from using online technologies by asking: If we use online technologies to economically expand access to higher education, what negative side effects can we expect? This question explores whether it is possible to both expand access to education and maintain quality. Underlying this question is the definition of quality. My reading leads me to believe that most critics of technology in education object to mandates from administrators who expect teachers to use technology to improve student outcomes and optimize productivity. A common lament is that administrators don't understand the true purposes of education and instead focus on efficiency (Cuban, 1996; Noble, 1997). When educators write about educational purpose, we usually find references to Socrates, the Enlightenment, or Thomas Jefferson. What these references represent in common is an intellect-based view of an educational system that seeks to enhance individual reasoning ability for the common good. This is an objective that can never be achieved by simply placing computers in front of teachers and students; adding extensive instruction in the use of computers won't help either. In this section, I examine counter-arguments to the proponents' claims of benefits to students, teachers, and institutions.

Students Although online access does put vast amounts of information within easy reach, that information is not usually presented in a context helpful to students, who can easily become overwhelmed with invalid, irrelevant, and biased data. Indeed, "information overload" is of great concern to educators (Gant, 1995). In addition, electronic communication is unlikely to replace face-to-face human interaction, regardless of how much time students and teachers invest in email or video conferencing. Students still prefer attending lectures with professors in a campus community. Although proponents of intelligent tutoring systems point to the value of computers that can automatically detect and adapt to individual styles of learning, critics of online education and technology in general worry about machines making this determination. For example, proponents of intelligent tutoring systems refer to the "student model" as a point of reference for the tutoring engine to determine how to proceed through a course of study. The student model records information such as student preferences, speed of acquisition of new knowledge, and retention of knowledge (Beck, Stern, and Haugsjaa, 1998). What a computer system cannot determine is whether a student's responses are related to irrelevant stimuli such as distractions and interruptions. Human professors can integrate this kind of information into evaluation of student performance and needs.

Teachers It's difficult to argue that teachers don't derive benefits from thinking about course objectives and pedagogies, but opponents of online education dispute that introduction of online technologies for instruction emanates from widespread teacher interest. Instead, critics suggest that online education is promoted by commercial interests and administrative goals for productivity enhancement, and that this dilutes the classical liberal arts education by over-emphasizing professional training and focusing on an economic outcome instead of a more integrated concept of personal growth. Indeed, a common justification for students learning to use computers is the ancillary benefit of developing a marketable skill, expressed by the sentiment: "At least you will have a job skill if all else fails with your education!" Critics argue that instead of focusing only on development of online teaching and learning systems, administrators should invest in many kinds of teacher development and encourage teachers to periodically re-evaluate all course content and pedagogy. In addition, they agree there is no challenge to the value of teachers acting as mentors to their students, but this can be achieved by reducing class sizes on campus instead of moving teaching activities to the teacher's computer-equipped office or home. One temptation teachers may encounter when focusing on mentoring instead of on lecturing is relying on external sources for course content. Teachers should be diligent in keeping up with advances in their fields and presenting new information to their students, and take an active role in evaluating content and pedagogy throughout the curriculum.

Institutions Just as televised instruction did not produce lasting economic gains for institutions of higher education, neither will online education. In fact, online education will ultimately be more costly to deliver than telecourses because, unlike telecourses which were one-size-fits-all scripted instructional models, the goal of online courses is to enhance individualization of instruction and increase communication between students and teachers. Critics argue this means smaller class sizes and more teacher time addressing individual student needs. Although it is honorable to want to expand accessibility to higher education, it is misleading to suggest that online courses provide educational quality equivalent to that experienced by students who attend classes on campus.

Critics are concerned about the depersonalization of the educational experience when teachers and students don't physically meet, and about negative effects on students who work in isolation, communicating with machines instead of people. They raise questions about social and cultural benefits derived from participating in university life that cannot be extended to distance students—aspects that are only partially realized by commuting students and best experienced through traditional university residence. We also hear concerns about awarding degrees to students who never step foot inside a college classroom. Again, this focuses on worries about what it means to be a college or university graduate, and the value we assign to personal interactions and acculturation to institutional systems.

There is ample evidence of the attraction of online education to the business community that needs workers trained as quickly as possible in the most current technologies. Using online technology to deliver this kind of training allows for infinite flexibility of content and format. Detractors, however, point to how quickly educational institutions are deploying online courses without careful analysis of the results, both academic and economic (Cuban, 1996). Concerns are raised about applications of technology for the sake of technology alone—for the appearance of being "advanced" or to encourage corporate financial support of education. Our tendency to jump to relatively easy financial cost-benefit analyses in support of increasing spending on technology can cause short-sighted decisions if there are not parallel considerations of intangible costs and benefits. Empirical measures are problematic in valuing participation in an academic community, development of analytical perspective, evolvement of tolerance, and a growing appreciation of education for its own sake. Unfortunately, these important aspects of higher education are often neglected in discussions about online education.

More concrete concerns have been raised that young, innovative teachers will be drawn to using online technologies and that the most academically advanced students will take online courses, eliminating much of the positive diversity we see in classrooms today. My own experience teaching parallel courses on campus and online suggest that it is, indeed, the good students who enroll in online courses and who benefit most from them. In addition, the most energetic and popular teachers are developing online courses, which take them out of the classrooms on campus.

Some faculty fear that online education is just the newest ploy by administrators and government policymakers to improve productivity, defined by increasing student-teacher ratios without concern for academic outcomes. They believe that if online courses prove economically feasible and are allowed to proliferate, they will undermine on-campus enrollment, ultimately forcing faculty who don't "do" online courses out. This is the argument that online courses are nothing more than telecourses with a fresh coat of paint. Although this is a possible scenario, it is far from the vision I have of the promise of online technologies for higher education.

Using Technology to Reconcile Educational Purposes

Looking back at the history of educational structures and the roles of students, teachers, and institutions, we find very few dramatic changes. Over time, students have sought out the masters and the great libraries, teachers have orchestrated the acquisition of knowledge, and institutions have supported these endeavors by controlling access and providing a community for students and teachers engaged in scholarly inquiry. Major transformations in access to information derived from advances in the production of written records, from handwritten manuscripts to books mass-produced with the printing press to digitized documents that are electronically accessible. What we observe in this is a gradual shift in control of this access from scholar to institution to student. Given the long and stable history of higher education structures, it is unlikely that application of online technologies to education will cause a major shift in the predominant roles of students, teachers and institutions. What we can expect, however, is dramatic improvement in methods used for accessing information and acquiring knowledge, whether as a component of a traditional classroom or as a self-contained remote educational unit. Online technologies hold the potential for increasing access, for improving the educational experience of current and potential students, and for providing cost savings, while preserving educational quality. In this section, I describe how this is possible.

Individualization of Instruction and Guidance First of all, online education is no more automated than professors developing lesson plans and following them in the classroom. Students will still communicate directly with their teachers and with other students, although these communications may not be time or place dependent. Research into artificial intelligence and cognition suggests that computer interfaces will be able to recognize cues from the user to determine learning modes and attention level, and will deliver learning materials in the proper mode. Furthermore,

online systems will include student guidance, health guidance, and other personalized resources.

Interactions Among Students and Teachers Unlike television, with its limited interactive components, online technologies permit extensive personal interactions. Course content and organization are designed and maintained by faculty, and we expect as much diversity there as we have today with on-campus courses. Just as students have preferences for on-campus teachers, so will they have preferences for online teachers. It will be a simple matter for students and faculty to have face-to-face interactions in real time or with purposeful delays. By recognizing that education is a social activity, we can expect a properly designed online educational system to provide an environment that closely parallels the cultural benefits found in classrooms and institutions. This may even provide a more equitable environment where biases emanating from gender and physical characteristics will be ameliorated (Downs, 1998). Rather than an isolating environment, it has been suggested that the Internet itself is a cultural environment, where participants regularly interact with others in their community (Ryder and Wilson, 1995; North, 1995).

Improvements in Pedagogy Instead of addressing the average student in a classroom, or assuming the worst of students, online technologies allow teachers to focus on: "fomenting questions, doubts, uncertainties; modeling strategies of inquiry; and criticizing the quality of results" (McClintock, 1998). Online educational systems will facilitate student-driven inquiry instead of dissemination of information selected by the teacher. Of course, students need guidance in deciding depth and breadth for study, and online technologies can be used to help students develop and follow individualized educational plans. Ideally, this will take the form of cultivating relationships with professors who are committed to the traditional role of mentoring students and encouraging scholarship and research that contributes to the existing knowledge base. In all cases, faculty should be leading these discussions, especially as we attempt to blend the need for occupational opportunity with the need for personal and intellectual growth. We cannot wait until the discussion is resolved before implementing anything—we have to start somewhere, but with the understanding that this is an evolving process.

Issues of Equity If we look at the dismal state of computer equipment in most publicly-financed schools as an indicator of computer ownership in related neighborhoods, we are indeed disheartened at the prospect of expecting widespread access to education through computers in homes. This is clearly a major hurdle today. On the other hand, we do find that regardless of income level, most American households have a color television and a telephone. With this in mind, one can imagine an inexpensive computer with wireless Internet access in most homes in the foreseeable future. Email will be free, as it is today, and internet access will also be free or a very slight additional telephone charge.

Other questions of equity are more problematic. Who should take online courses? We have a sense that online courses are, at worst, not harmful to capable students. But what about the rest of the student population? Because online technologies allow non-textual communication, it might be a good way to provide access to students with poor communication skills, or in other languages. Sound and video provide excellent alternatives. Students who have not had successful educational experiences can benefit from online systems that adapt to their learning pace and style and provide additional support for learning such as intelligent tutoring.

The question of equity often results in examination of tradeoffs between no access to education and access to "almost as good as" education. If we choose on the side of inclusion, as policymakers have recently done in various recent legislative decisions, then we want to make the distance experience as good as it possibly can be.

A New Model I refer to the new focus on increased access and highly individualized education as "Education for One." This model has five primary components. The first component is the theme of expanding access to education. All who want to

explore educational paths to achieve their potential should be accommodated by public education. The second component is the realization that lockstep learning and one-size-fits-all curricula limit the effectiveness of education for many, if not most, students. Although group-oriented instruction has been the mainstay of education through the centuries, attempts to transform education by replicating this approach with technological delivery methods, such television and computers, have been dismal failures. The question of efficiency is not longer merely a question of preserving time as it was in the traditional industrial model. Instead, we must look to technology to improve efficiency of learning so that students spend their time more effectively. This component represents the shift in emphasis from efficient use of teachers' time in the classroom to efficient use of teachers' expertise in designing learning experiences that meet cognitive needs of a broader array of students. This shift will be the most critical factor in ensuring educational quality.

The third component of the new model is the individualized nature of instruction. Individualized instruction includes adaptive assessment, intelligent tutoring, and courses of study that are guided by agreement between teachers and students, all of which inform a course content that responds to needs of individual learners. Different learning styles can be accommodated, courses can be presented in multiple languages, and students can be supported with aural and visual interfaces. Extensive communication between teachers, students, and advisors will help ensure that students achieve their academic and professional goals. The fourth component is time and place independence of students and teachers. Students will not be required to attend a specific institution, although they may be required to participate in academic activities at nearby institutions. All participants will use Internet-based communication tools for synchronous or asynchronous dialogue. Students will work together and possibly with experts from other academic institutions or in the private sector to complete coursework or research using these tools.

The fifth component is cultivation of an academic community that is both parallel to and integrated with the parent institution. In addition, the academic community will cooperate with the global higher education community to achieve greater standardization of post-secondary degrees. At the local level, students will be encouraged to work in small groups with a professor or graduate student in much the same way as students work with teaching assistants today.

This five-part model encourages a blending of classic and professional education for individual needs, improves accessibility to education, and is less costly than building new colleges and universities. In addition, much of the technological and pedagogical capability is already in place. Many institutions have an Internet infrastructure, cognitive scientists have made headway in understanding the roles of motivation and engagement in learning, and faculty are learning how to design effective course materials for distance learners. Also, students are enrolling and succeeding in online courses, and institutions are funding curriculum development and administrative student support for online education. A looming question at this point is whether online systems can be designed to help non-traditional college students, or whether only certain groups of students can benefit—students who are already educationally successful.

Conclusion

At first glance, it seems that technology cannot possibly solve long-standing conflicts in purposes of education. Certainly our experiences in using technology for instructional television and computers in classrooms exemplify the failure of technology to improve educational practices and student outcomes. A key reason for this failure was a lockstep approach to teaching with technology; a digression from what happens in the classroom where teachers and students interact. Current online technologies facilitate communication between students and teachers, and make possible highly individualized interactions with instructional content, thereby resolving many of the problems introduced by previous technologies.

I agree with critics of online instruction in that we cannot simply deploy online

education in a haphazard fashion. This technology introduces as much opportunity for the abuse and neglect of students as for improvement in educational experiences. It is my view that if we keep multiple purposes of education in focus we will be able to avoid some of the pitfalls and design innovative systems that truly meet the needs of our society. By using online technologies to make education accessible to under-served populations and individualizing the ways knowledge is acquired we can achieve the goals of creating an educated citizenry and resolving social inequities in an economically responsible manner.

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